# Research Develop

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# Research & Development

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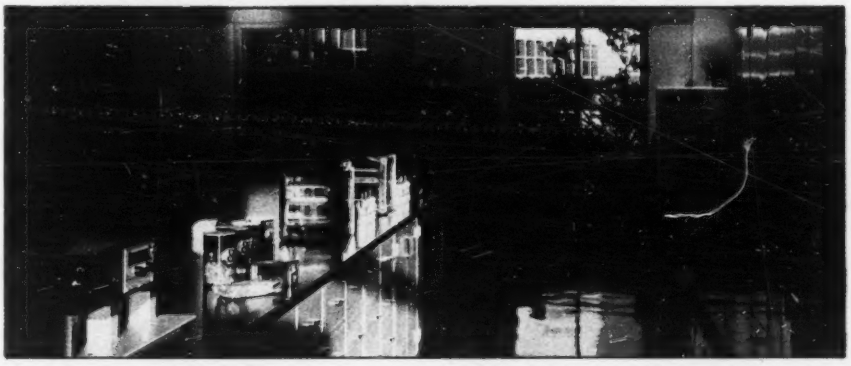
**Natural light reaches into labs.** **See p 74.**

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ABOUT THE COVER

*R&D*'s 1986 Lab of the Year, the Robert M. Schaeberle Technology Center of Nabisco Brands Inc. at East Hanover, NJ, is a place of contrasts. The laboratory's designers had to provide a people-oriented structure that would further creativity. At the same time, the lab had to be functional and efficient. The project had to be completed as quickly as possible.

The Lab-of-the-Year judges also awarded High Honors to the Monsanto Research Center at Chesterfield, MO.

An article describing the Lab of the Year and the High Honors Lab begins on p 74.


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# R&D industry has younger, leaner look for days ahead

*Belt-tightening changes in employment practices appear to be major factors in new shape for industry profile; women continue to make gains relative to men as median salary levels decline.*

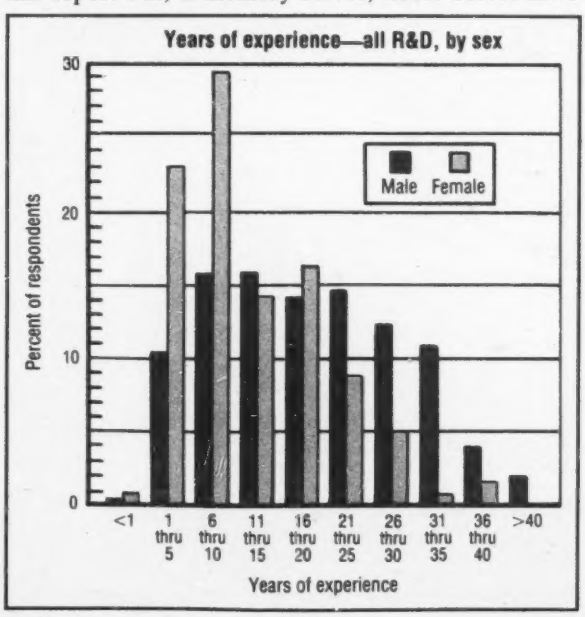
**Robert R. Jones,** Editor

THE PAY SCALE in industrial R&D has taken some lumps in the recent economic slump, and has pulled the median salary for all R&D down with it. At $40,030 per year, the median for all R&D workers in all types of workplace is down 0.4% from last year's $40,180, if the more than 3,600 respondents to this survey are representative of research and development.

While there are no drastic differences in our industry profile from last year's report, there are small dips in a number of indicators. Occasional dips have been routine in the nearly 15 years that we have been writing this report but, if memory serves, never before have there been so many in one year.

The median salaries for workers in government and universities rose during the past year, but not enough to offset the decline in industry. This and a number of other changes for workers in research and development would appear to be direct results of changes in employment policies which have encouraged early retirement on the one hand and have led to reduced hiring on the other.

Even with a decline last year in place of the usual increase, median salaries for R&D in 1986 remain close to what inflation would have done to 1980 salaries. Thus, R&D workers' buying power has held up.




**Median salaries all R&D by workplace**

| | 1980 | 1985 | 1986 |
|---|---|---|---|
| Government | $29,733 | $39,790 | $40,020 |
| Industry | 28,354 | 40,980 | 40,040 |
| University | 25,685 | 34,950 | 35,030 |

With cutbacks at both ends of the employment range, the middle has become stronger. This is apparent when we compare salary and educational achievement. R&D workers whose top academic degree is a master's fit mid-range in the salary scale. And, consistent with the above, they are the only ones in that comparison table whose salaries increased last year.

In the same period, the percentage of respondents with master degrees declined only 1.6% while the percentage of PhDs fell by 9.1%. Those early retirement programs could be expected to remove some of the highest paid PhDs from a research staff.

And we find that the spread in career earnings for a PhD over a master degree has declined sharply this year after having climbed for several years. Last year's spread was $470,000, up $100,000 from a year earlier.

This year the spread has declined to $340,000, down 27.7% in one year and 8.1% below the spread of two years ago.

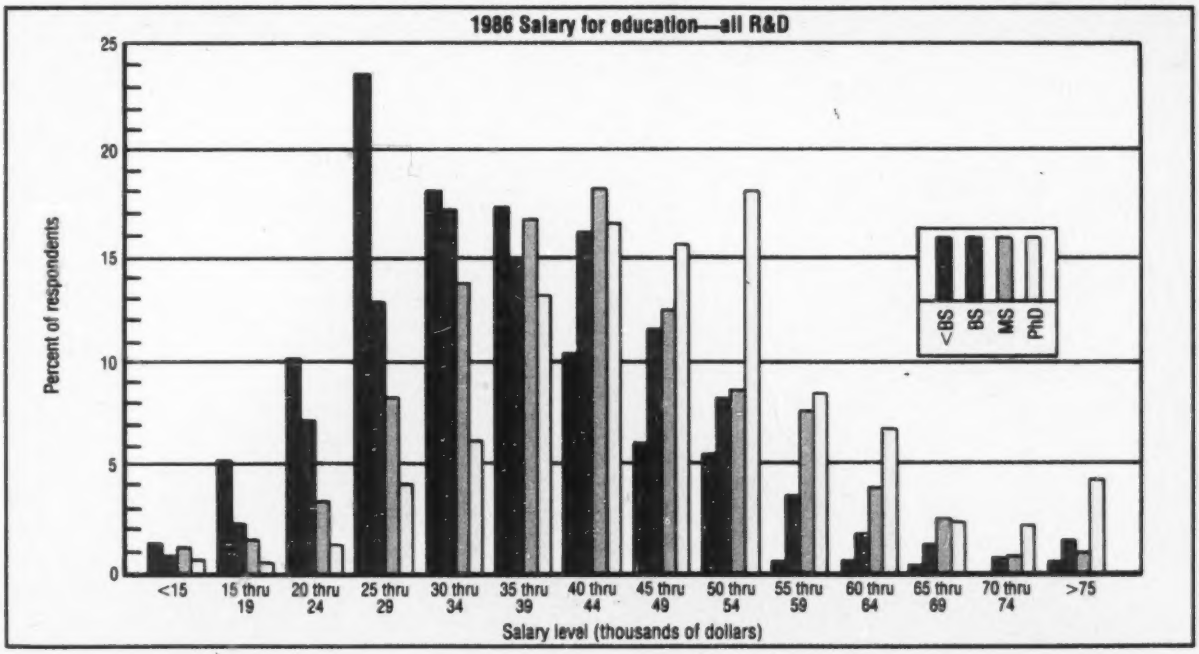
But the master degree was the exception in the academic comparisons. The advantage of a PhD over a baccalaureate degree increased 9.9% to $780,000 compared to last year's $715,000. This is based on a 25-year working career for the PhD, with interest figured at 10% and $300,000 allowed for tuition, missed earnings, etc.

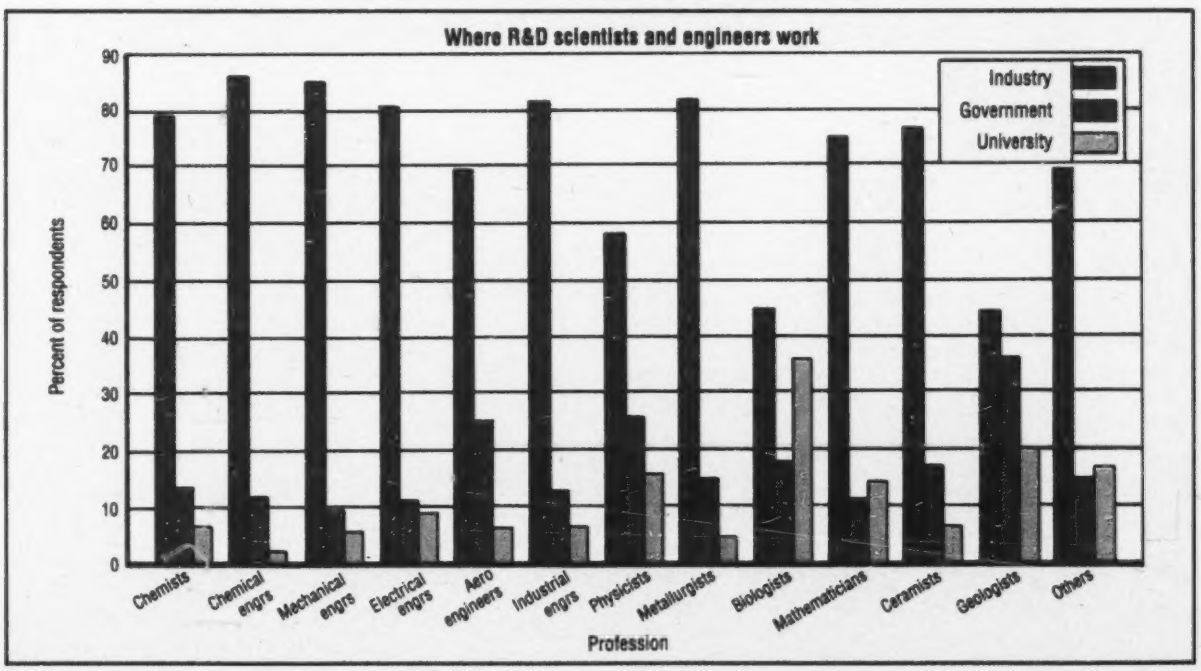
With 5.6% of our respondents reporting more than 35 years' experience, it is not inconceivable that some PhDs will have a 35-year career. Those who do could expect to reap a $2,678,000 career advantage over the person whose education stops after a BS, because the later years of the career are where the income difference is most striking.

If you know someone who is wondering about the advantage of college education at all, the answer is that it is real, and that it increased during the past year at a rate greater than the rate of inflation.

The benefit for a BS over less than BS now is $590,000, up nearly 4.5% from last year. This means that—after adjustments for tuition and other factors—those four years invested in a college education will return $147,000 for each of those years.

Going on to get an MS is worth even more this year, what with the above-mentioned shift in the relative value of a master degree in the salary comparison. This year, adding the MS to a BS is worth $437,000



over a 25-year career, or $17,500 more income during each of those career years.

At the extreme end of the comparison, getting a PhD over not having any degree could be worth $1,173,000, up 7.4% from last year and 34.1% from two years ago. That works out to an average of $3,900 more in the pay check *each month* over a 25-year career.

Additional information and comparisons may be derived from the following summation:

**R&D salaries compared by academic degrees**

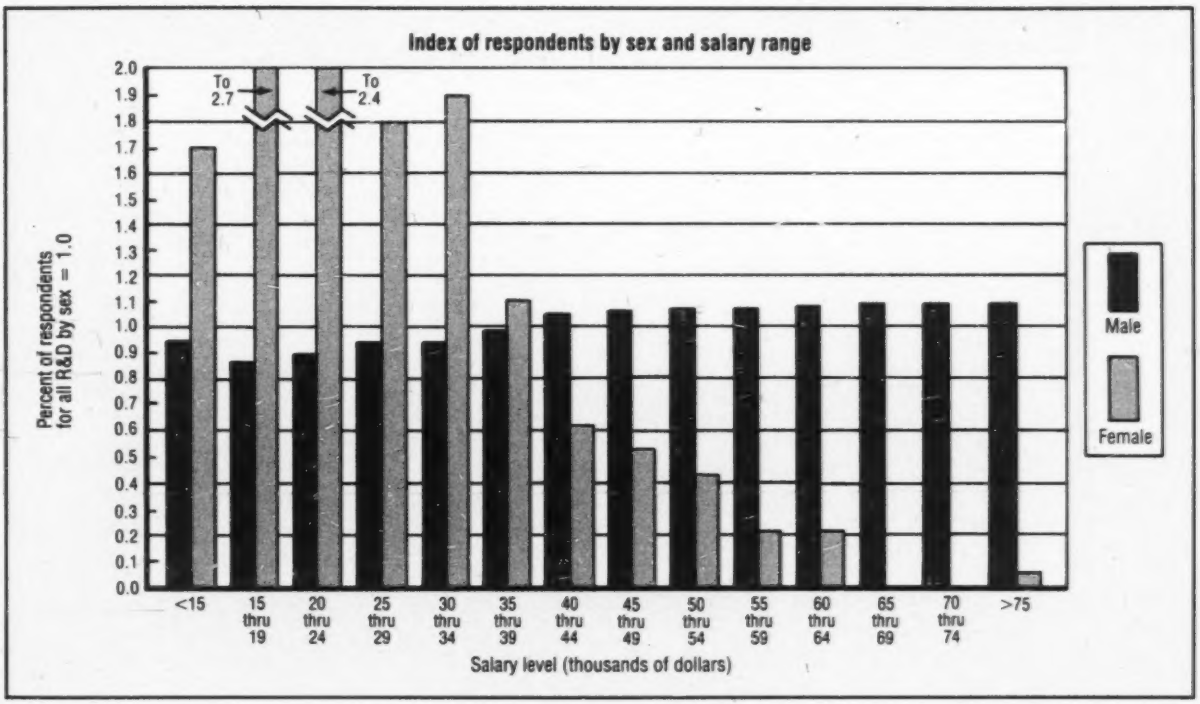
| Degree | Median salary 1986 | Median salary 1985 | Percent change | Annual difference* 1986 | Annual difference* 1985 | Difference Increase (percent) |
|---|---|---|---|---|---|---|
| Doctorate | $45,050 | $45,720 | −1.4 | $5,020 | $6,200 | −19.0 |
| Master | 40,030 | 39,520 | +1.3 | 4,970 | 3,180 | +56.3 |
| Bachelor | 35,060 | 36,340 | −3.5 | 5,010 | 4,870 | + 2.9 |
| <Bachelor | 30,050 | 31,470 | −4.5 | | | |

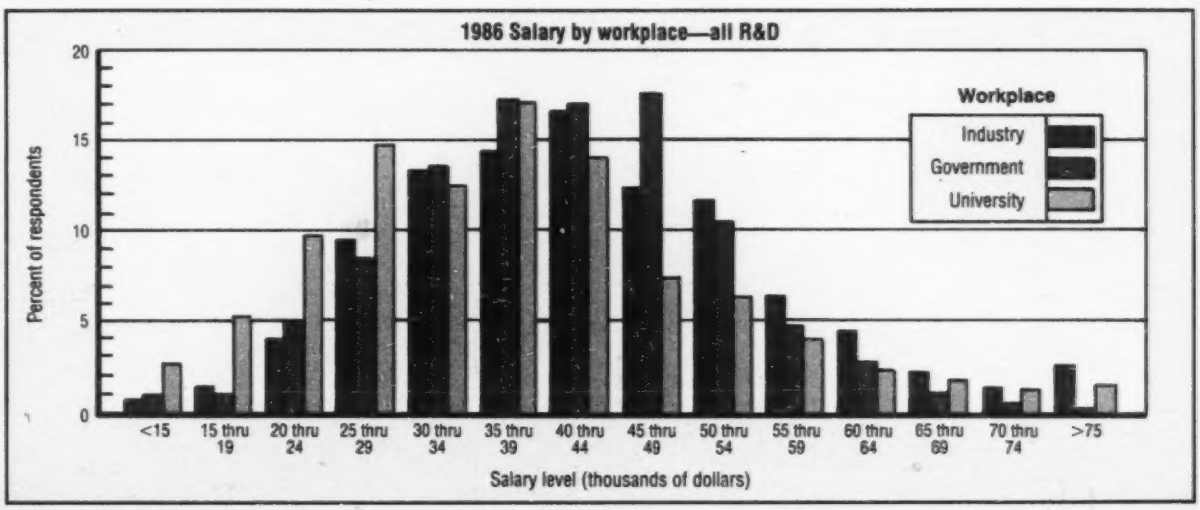
*Difference above next lower degree

Information obtained in this study makes it clear that the net value of any degree depends on the individual degree holder's field of endeavor and sex; whether the employer is from industry, university, or government; and the individual's skills and performance. In addition, it should be remembered that the figures derived above are from salary medians, and obviously some individuals will be above and others below these figures, regardless of academic degrees.

As regards sex differences in salaries, we have pointed out for a number of years that women who work in research, development, and quality assurance do not earn as much as men do. In too many instances, it is a result of discrimination, but there are valid reasons in some other instances of lower salaries for women.

Our typical female respondent will have less experience and less time with her present employer, and is less likely to have an advanced degree than is the typi-



cal male. All of these have important bearing on the size of the salary.

As an example, the median income for male R&D workers in industry is $40,050, a figure that can be contrasted with the median for females in industry, $30,070, or females in universities, $25,100.

Despite the fact that women in universities were the only group whose median rose last year over the year before, they still rank at the bottom of the list. And despite all of the gains that women have made in salaries, the highest female median still falls almost $5,000 per year below the lowest for males. The rankings are as follows:

| | 1986 | 1985 | % gain |
|---|---|---|---|
| Men in industry | $40,050 | $41,750 | −4.1 |
| Men in government | 40,040 | 40,400 | −0.9 |
| Men in universities | 35,040 | 36,040 | −2.6 |
| Women in industry | 30,070 | 31,590 | −4.8 |
| Women in government | 30,040 | 33,130 | −9.3 |
| Women in universities | 25,100 | 24,040 | +4.4 |

In this year's survey, the median annual income for all males is $40,040, down 2.2% from $40,990 last year but still above the $38,440 of two years ago. For all females, it is $30,060, down 3.4% from last year's $31,130, but still well above a year earlier's $28,990.

Over recent years we have said more than once that women are making gains in the effort to get equal pay for equal work. This year's study shows that women did far better than men in terms of salary increases. While 52.8% of the men got no increase or increases of less than 6%, only 42.5% of the women were in that group. Fully 42.8% of the women respondents reported salary increases of 6 through 9%, and 14.7% reported increases of 10% or more.

**R&D salary increases by sex**

| Amount | 1984 % Male | 1984 % Female | 1985 % Male | 1985 % Female |
|---|---|---|---|---|
| None | 9.4 | 8.6 | 11.6 | 7.7 |
| Less than 2% | 2.8 | 3.7 | 3.6 | 3.5 |
| 2 through 5% | 36.6 | 35.2 | 37.6 | 31.3 |
| 6 through 9% | 37.8 | 34.5 | 35.8 | 42.8 |
| 10 through 13% | 9.8 | 14.6 | 8.3 | 8.9 |
| 14% or more | 3.6 | 3.4 | 3.1 | 5.8 |

Of the women respondents this year, 64.9% report that they are earning more than $30,000 per year, up from 56.6% last year, a 14.6% increase. Of the men, 84.2% report annual salaries of more than $30,000 per year, up from 80.4% last year, a 4.7% increase. Again, salaries for women are moving closer to those for men.

This and other information about comparable salaries is conveyed in a newly designed chart which presents income in each salary range for each sex on an index basis. Inasmuch as 92.8% of this year's respondents are male, and if all else were equal, 92.8% of the workers in each salary range would be males and 7.2% female. Thus, the chart indicates 1.0 for ranges where the percentage of males is 92.8. If only half that percentage of males is in that range, the index for males is 0.5.

On the chart showing years of experience by sex, it

**1986 R&D Industry profile:**

1. What is your annual salary?
   a. Less than $15,000 ..... 0.9%
   b. $15,000 to $19,999 ..... 1.7
   c. $20,000 to $24,999 ..... 4.7
   d. $25,000 to $29,999 ..... 9.9
   e. $30,000 to $34,999 ..... 13.1
   f. $35,000 to $39,999 ..... 15.1
   g. $40,000 to $44,999 ..... 16.5
   h. $45,000 to $49,999 ..... 12.5
   i. $50,000 to $54,999 ..... 10.9
   j. $55,000 to $59,999 ..... 5.8
   k. $60,000 to $64,999 ..... 3.7
   m. $65,000 to $69,999 ..... 1.9
   n. $70,000 to $74,999 ..... 1.1
   o. $75,000 or more..... 2.0

2. Your raise during the past year was
   a. None..... 11.3%
   b. Less than 2% ..... 3.6
   c. 2% through 5% ..... 37.1
   d. 6% through 9% ..... 36.3
   e. 10% through 13% ..... 8.3
   f. 14% or more ..... 3.3

3. How long have you worked for your present employer?
   a. Less than 1 year ..... 3.4%
   b. 1 through 3 years ..... 14.7
   c. 4 through 6 years ..... 17.9
   d. 7 through 9 years ..... 13.8
   e. 10 through 12 years ..... 9.1
   f. 13 through 15 years ..... 6.9
   g. 16 through 18 years ..... 8.3
   h. 19 through 21 years ..... 6.7
   i. 22 through 24 years ..... 6.3
   j. 25 through 27 years ..... 4.4
   k. 28 through 30 years ..... 3.5
   m. 31 through 33 years ..... 2.3
   n. 34 through 36 years ..... 1.6
   o. More than 36 years..... 1.1

4. What is your age?
   a. Under 26 years..... 2.0%
   b. 26 through 30..... 9.5
   c. 31 through 35..... 15.1
   d. 36 through 40..... 16.5
   e. 41 through 45..... 15.7
   f. 46 through 50..... 13.1
   g. 51 through 55..... 12.0
   h. 56 through 60..... 9.3
   i. 61 through 65..... 5.6
   j. Over 65 years..... 1.2

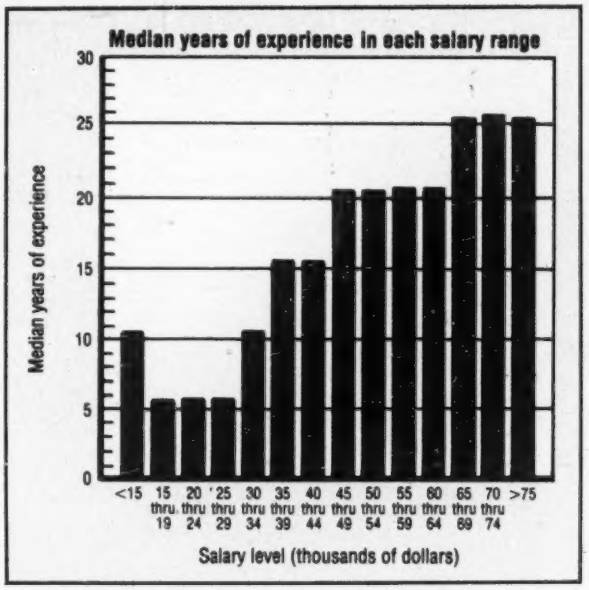
5. How many years of experience do you have?
   a. Less than 1 year ..... 0.2%
   b. 1 through 5 years ..... 11.3
   c. 6 through 10 years ..... 16.7
   d. 11 through 15 years .... 15.7
   e. 16 through 20 years .... 14.3
   f. 21 through 25 years .... 14.3
   g. 26 through 30 years .... 11.7
   h. 31 through 35 years .... 10.1
   i. 36 through 40 years ..... 3.9
   j. More than 40 years..... 1.7

6. What is the highest degree you hold?
   a. Less than bachelor..... 8.2%
   b. Bachelor ..... 36.6
   c. Master ..... 25.2
   d. Doctorate ..... 30.1

7. What is your profession?
   a. Chemist..... 37.1%
   b. Chemical engineer ..... 7.5
   c. Mechanical engineer ... 11.6
   d. Electrical engineer ..... 8.6
   e. Aeronautical engineer... 1.4
   f. Industrial engineer ..... 0.9
   g. Physicist ..... 7.3
   h. Metallurgist..... 4.9
   i. Biologist ..... 6.3
   j. Mathematician ..... 0.7
   k. Ceramist ..... 1.3
   m. Geologist..... 1.4
   n. Other ..... 10.9

8. Do you work in
   a. Industry..... 75.3%
   b. Government..... 14.6
   c. University ..... 10.1

9. Are you
   a. Male ..... 92.8%
   b. Female..... 7.2




is obvious that there is a large body of experienced males in R&D, with 40.2% having more than 20 years' experience. Even though this is down from 41.5% last year, it still is far ahead of the women's figure of 17.0% with 20 years' experience, despite the fact that the latter figure is up from 15.9% last year.

One cannot have long experience while young, and a large portion of the female workers, 68.4%, are younger than 40 years of age. Only 41.3% of the men are that young.

One result of the relative youth of the females is that few have PhDs. The percentage with PhDs in this year's respondents is 20.4, up from 19.1 last year and 14.8 two years ago. For this year's male respondents, the figure is 30.7%, down from 34.4% last year and also down from close to 32% for the preceding several years.

Time spent with the same employer often is reflected in higher salary. The fact that 5.2% of the male respondents have been with their present employers for more than 30 years helps to explain the males' higher positions in the organization and on the salary scale. Even though this figure is down from 5.9% last year, it still is far above the 1.2% for females for both years.

For many reasons women are unable to stay with a single employer as long as men are. This puts a large number of females in the short-term brackets. This year, 53.5% report having less than seven years with their present employer. Only 34.7% of the males have been with their present employer less than seven years.

As you study these charts and tables and make comparisons with previous years, you will find a substantial number of clues to the changes that we mentioned in our opening comments. More often than not, the median or the upper range in industry has declined slightly, and this has pulled the whole scale down, because industry dominates R&D in the U.S.

One result is that the entire profile of R&D has been changed. It will be another year before we can say whether this begins a trend that reflects changed employment practices, or merely is a glitch or a transient in our data. R&D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CIRCLE 162 ON INQUIRY CARD

# OPINION POLL RESULTS

## Readers tilt cautiously toward R&D contracting

READER OPINION on the subject of contract research has changed noticeably since 1973. While they stop far short of endorsing the use of contracts as a standard approach to research and development, the nearly 600 respondents to this survey are much more willing to accept the idea than they or their counterparts were 13 years ago.

And, along with those changes, opinions on other questions are virtually identical to the opinions expressed in 1973. The same questions were asked in both surveys.

Reader evaluation of the desirability of traditional grant procedures from the standpoints of science and of mankind differ by only a few percentage points in the two surveys.

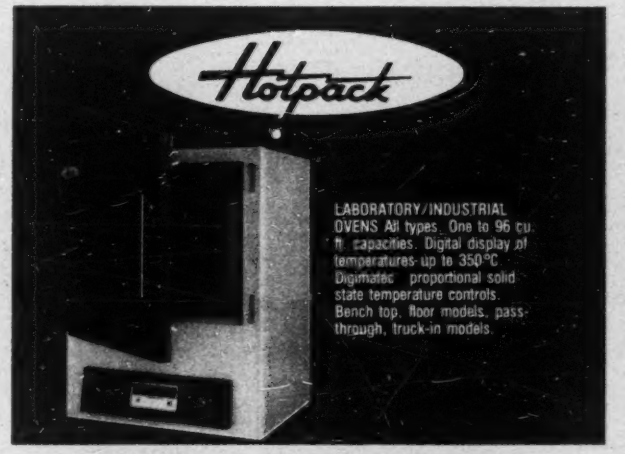
The same is true for having research needs evaluated for funding purposes by a board of scientists selected for that purpose (an idea that was being pushed in 1973), by NSF, or by Congress.

Among the changes, the response to "Does it seem to you that grants should be eliminated by funding agencies in favor of contracts designed to achieve efficiency in research?" changed from 22% voting *Yes* or *Yes, mostly* to 32%.

Those who feel that contract research has gone too far dropped from 1973's 47% to 28%. And the portion favoring a policy statement against research contracts declined from 35% to 17%.

Complete results of the two surveys follow:

| | 1986 | 1973 |
|---|---|---|
| *1. Do you feel that traditional grant procedures have been desirable for science?* | | |
| a. Yes, definitely | 22% | 24% |
| b. Yes, generally | 45 | 49 |
| c. Neutral | 13 | 8 |
| d. I doubt it | 13 | 12 |
| e. Definitely not | 4 | 5 |
| f. No opinion on this | 3 | 2 |
| *2. Do you feel that traditional grant procedures have been desirable for mankind?* | | |
| a. Yes, definitely | 21% | 20% |
| b. Yes, generally | 45 | 50 |
| c. Neutral | 15 | 11 |
| d. I doubt it | 12 | 13 |
| e. Definitely not | 4 | 5 |
| f. No opinion on this | 3 | 1 |
| *3. Does it seem to you that contracts for research make the most sense when there are recognized and specific needs?* | | |
| a. Yes | 49% | 39% |
| b. Yes, but . . . | 39 | 49 |
| c. No | 10 | 11 |
| d. No opinion on this | 2 | 1 |
| | **1986** | **1973** |
| *4. Does it seem to you that grants should be eliminated by funding agencies in favor of contracts designed to achieve efficiency in research?* | | |
| a. Yes | 14% | 11% |
| b. Yes, mostly | 18 | 11 |
| c. Sometimes | 40 | 41 |
| d. No | 28 | 37 |
| *5. Should the research needs be rated for priority by a top scientist or group such as NSF, and contracted accordingly?* | | |
| a. Yes | 52% | 50% |
| b. No | 48 | 50 |
| *6. Should research needs be rated by Congress or other non-scientific group, and so contracted?* | | |
| a. Yes | 8% | 9% |
| b. No | 92 | 91 |
| *7. Has contracting gone too far, already?* | | |
| a. Yes | 28% | 47% |
| b. No | 72 | 53 |
| *8. Do you favor a policy statement against contracts?* | | |
| a. Yes | 17% | 35% |
| b. No | 83 | 65 |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